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A SCIENCE OF THE SCIENCES.

The Groundwork of Science; a Study of Epistemology. By St. George Mivart, M.D., Ph.D., F.R.S. (The Progressive Science Series.) Pp. xvii + 331. (London: John Murray, 1898.)

INASMUCH as science is an organised knowledge of the phenomena of nature and the laws which govern these phenomena, and since this knowledge is acquired through the senses and interpreted by the intellect of man, it is obvious that the groundwork of science must be sought for in the human mind. To many this may seem a self-evident proposition, but it nevertheless furnishes Dr. Mivart with material for the ten chapters of which the present work is composed. The aim and objects of the book are set forth in a preliminary way in the introductory chapter, from which we give the following extract as fairly representing the author's position:

> "It is not enough for the true man of science to be acquainted with many sciences, and to reflect on the knowledge he so possesses. The rational mind sooner or later seeks to know what is the basis of his own knowledge and the ultimate groundwork of all science. It thus calls for a science of science, and cannot rest satisfied without a pursuit of Epistemology, or the study of the grounds of all the learning the mind of man can acquire" (p. 2).

In the second chapter the author sets out with the object of discussing the classification of the sciences, but wisely comes to the conclusion that instead of classifying it is sufficient to simply enumerate the sciences as being the raw material with which epistemology has to deal. The arguments which lead to the conclusion that it is futile to attempt to classify the sciences in any satisfactory way are ingeniously marshalled, and will, we imagine, be convincing to most scientific readers. After all there is only one science of nature; all our divisions are more or less arbitrary, and necessitated only by the finiteness of the human intellect.

In the third chapter, entitled "The Objects of Science," Dr. Mivart discusses at great length the idealism of Bishop Berkeley, to whose influence he traces "the whole of the philosophy of Germany and Holland, from Spinoza to Hartmann." So fairly does the author state the case for the idealists, that the reader might at first be disposed to imagine that Dr. Mivart is identifying himself with that school. It is not till we reach p. 43 that the first breath of realism appears, and from thence on to the end of the chapter we find ourselves in a healthier scientific atmosphere. Here again the arguments used against the pure idealist, although somewhat unnecessarily lengthy, are well considered and cannot fail to leave the reader in a more rational state of mind as regards his scientific position:

> "The conviction, then, that science is really concerned not alone with thoughts, but also with external, independent, and extended realities, is so far justified" (p. 64).

Having arrived at this conclusion, and having incidentally (p. 84) disposed of the new Monism, the author sums up the chapter by describing in general terms the objects of science as mental, physical and metaphysical; and in the fourth chapter he discusses the methods of science, which methods are summed up under ten fundamental propositions (pp. 106-107). The author considers that the truth and certainty of these propositions is implied by the methods of science; and we do not suppose that many scientific men will join issue with him here. Some of the said propositions—such as "nothing can at the same time both be and not be" and "some axioms are self-evident"—may appear to many readers as truisms.

In the fifth chapter, having the title "The Physical Antecedents of Science," the author sets out from the proposition that since knowledge consists of mental states or feelings, and since feelings are the result of physical organisation, it is necessary to have an acquaintance with the physiological machinery by which psychical results are made possible. This chapter accordingly deals with what may be described as an outline sketch of classification and morphology with more special reference to the structure of the nervous system of man. In discussing instinct the author states that "instinctive movements differ from reflex actions in that they are not merely responsive to a stimulus felt, but respond to that stimulus in such a manner as to serve a future unforeseen purpose" (p. 127). The same definition is expanded at greater length on p. 132. The sixth chapter discusses the psychical antecedents of science, and opens with the following paragraph:

> "The time has now come to leave behind us, as far as may be, questions of mere physics and physiology, and turn our attention to what concerns the declarations of our own consciousness with respect to our feelings and cognitions" (p. 139).

In other words the real business of the book begins here, and the five chapters which the reader is supposed to have mastered by the time he reaches this point must be regarded as dealing more or less with preliminary considerations. One of the main features of this chapter is the discussion of the differences between the lower and higher mental processes, the former comprising mere feelings or sensations, and the latter the intellectual perceptions. It is conceded that the lower psychical faculties exist in animals other than man. It is suggested that the term *consentience* should be applied to the unconscious manifestation of sensuous impulses of diverse kinds in the individual. The question whether animals possess the higher faculties, lower in degree, but similar in kind to those possessed by ourselves, is answered by Dr. Mivart in the negative. He denies them the faculty of reasoning, and the ethical or moral sense, and considers that "consentience" explains all their actions. The human faculty of reason is considered to be different in kind from anything possessed by lower animals (p. 162). In support of this contention some pages are devoted to arguing away those acts of animals which have been and are still considered by many psychologists to be due to intelligence. The subject of instinct is again discussed in this chapter, and the theory of natural selection is considered to be inadequate both for the explanation of the origin of the instincts of animals and the "lowest psychical powers" of man. The general conclusion is that there is a distinction in kind between man and animals, and the crucial difference is expressed by the statement that "men speak but animals are dumb." From this we are led to the seventh chapter, on "Language and Science."

Regarding speech, whether expressed by mere sounds, by articulation, or by gesture, as an expression of intellectual faculties of the higher order, the author will not allow that animals possess any power of intercommunication beyond the lower form of emotional language; and he devotes some pages to an adverse criticism of the views of the late Dr. Romanes on this subject. With respect to the origin of language, Dr. Mivart offers no theory of his own, but concludes that intellectual thought was in man antecedent to language; in other words, that thought is the cause of language, and not language the cause of thought. The general idea which the reader will gather from this chapter is that, in the author's opinion, there occur from time to time breaches of continuity or new departures in the order of nature, and that the transition from non-living to living matter, from non-sentient to sentient beings (*e.g.* plants to animals), or from sentient organisms to the intellectual organism, *i.e.* from animals to man, are cases in point.

The eighth chapter is entitled "The Intellectual Antecedents of Science," and begins with a demolition of the ultra-sceptical intellectual nihilist whose mind has no certainty as to the truth of anything which cannot be proved. The author insists

> "that the mind of each one of us . . . already possesses absolute certainty about some things, and that his [the reader's] intellect declares that things which are clearly seen to be evident in and by themselves, possess the greatest certainty which it is possible for the human mind to attain to, and that such certainty is abundant" (p. 225).

Further on (p. 227) it is pointed out that this certainty is attained ultimately by thought and not sensation, and that intellectual perception or intuition is the supreme and ultimate criterion of truth. The reality of the ego and the difference between the objective and the subjective is considered to be proved in the former case, and bridged over in the latter by the memory. The power of memory is, in fact, regarded as proof of the continuous existence of the individual and the reality of "objectivity." It is conscious memory which unites the past with the present, and enables the individual to declare "I am." This faculty of conscious memory is considered by the author to be another profound distinction between man and other animals (p. 240).

In the following chapter, which deals with the "Causes of Scientific Knowledge," Dr. Mivart begins by quarrelling with the old statement that "everything must have a cause," which he considers to be quite untenable because it would lead us to "a *regressus ad infinitum*." He replaces the ancient dictum by the statement that we do see "that every change or new existence is, and must be, due to some cause." Presumably this is based on the idea that the question of "causation" only arises when some change or new state in the existing order of things is observed. By "causation" it must be understood that the author means something more than mere sequence; he argues for a "force" or "power" as a primary ultimate idea which cannot be resolved into simpler conceptions (p. 261). This force or power is not physically perceptible by the senses, but is intellectually perceptible Herein Dr. Mivart of course finds himself in antagonism to Mr. Herbert Spencer. This kind of causation is subsequently (p. 263) exalted into a law—"a necessary and universal truth which carries with it its own evidence"—and out of this law is further evolved the great principle which underlies all science, viz. the uniformity of nature. The reader will at once confront this principle of uniformity with the statements in Chapter viii. concerning the breaches of continuity in the order of nature to which we have already called attention. Was the law of uniformity broken, for example, when "inorganic" matter became living? According to Dr. Mivart discontinuity must be regarded as part of natural uniformity (p. 288).

In this chapter there is discussed also the theory of natural selection in so far as it bears upon epistemology. The author's views respecting the Darwinian theory have long been before the scientific public, and are reiterated in this work in such statements as the following:—

> "By this system, then, unreason may be regarded as practically lord of the universe, and the source of all the beauties and harmonies which exist in organic nature" (p. 273).

The inadequacy of natural selection to account for the genesis of our perceptions of an extended external world is considered at some length, and it is contended that there are many other kinds of knowledge or "intuitions" which cannot be attributed to natural selection. The general drift of the chapter may be, perhaps, summed up in the statement that the universe is an orderly and not a disorderly arrangement, and that since order suggests intelligence and reason there is such an intelligence and reason underlying it all. The "breaches of continuity," such as the passage from non-living to living matter, from the insentient to the sentient, from the irrational to the rational (p. 296), are considered by the author to require "an eternal and ever-present reason latent in all the phenomena of which we can take cognisance." It may be added that the combination of hydrogen and oxygen to produce something so very unlike its constituents as water (p. 285), and the discontinuous variations (? monstrosities) treated of by Bateson in his work on variation (p. 288) are pressed into the service as "new departures" calling for special explanation, and so Dr. Mivart slips an external intelligence into the cosmos.

The tenth and concluding chapter is entitled "The Nature of the Groundwork of Science." In discussing the matter of science, or the field wherein scientific workers have to labour, the author comes to some very paradoxical conclusions respecting matter, motion, space and time. The breaches of continuity or new departures again figure as reasons for recognising

> "that the universe is pervaded . . . by something which our intellect reveals to us as having necessarily some analogy with our own reason and intelligence, however inconceivably greater it may be" (p. 310).

Besides the physical, there is the psychical subject-matter with which science has to deal; so that, as the author sums it up, the worker in science is concerned with things and thoughts.

Respecting the tools which the science workers must use, there are, of course, only the senses and the intellect. The intellectual weapons are those fundamental principles which were laid down in the fourth chapter, and which are here recapitulated. In this last chapter also there are discussed some highly abstract possibilities as to the structure, composition and nature of the universe—whether there is anything more than an "intelligent energy," whether there is only one "essential kind of matter with intrinsic motion," and so forth. In fact, by ringing the changes upon various possibilities and conceivabilities, the author at this stage makes a strain upon the assimilative faculty of his reader, which will leave the latter in a state of hopeless bewilderment, unless his (the reader's) mental digestion is in perfect working order. The chief definite conclusions which are drawn are that it (the universe) cannot consist of one kind of energy only, that it is impossible that intellect can have been evolved from mere physical force, and that animals show no signs of latent intellectuality. It is further insisted

> "that the portion of truth which we are able to attain to in our investigations of the cosmos, is but an unimaginably small portion of the whole" (p. 317);

a statement which will, we imagine, not be seriously challenged by workers in science. To the latter, viz. the science workers, Dr. Mivart devotes some attention in the concluding pages of his book. The narrowing effect of extreme specialism upon the mind is an undoubted evil, as the author points out. But there is the opposite evil of becoming diffuse to the extent of a practically useless attenuation of the mental faculties. Between these two extremes the active worker in modern science will find it difficult to pursue his course if he desires to keep pace with the development of science generally, as well as to advance his own subject in particular.

In a kind of summing-up the author elaborates further his ideas as to the "intelligent activity" which pervades the universe. The results of this activity harmonise with our reason, but yet it acts in ways different to those which we should adopt in order to arrive at similar ends. It is a "non-human rationality" (p. 321). There is no such thing as waste in nature. Dr. Mivart does not say so explicitly, but he implies that all apparent waste is unseen economy. The groundwork of science is defined (p. 322) as:—

> "The work of self-conscious material organisms making use of the marvellous intellectual first principles which they possess in exploring all the physical and psychical phenomena of the universe, which sense, intuition and ratiocination can anyhow reveal to them as real existences, whether actual or only possible."

The non-human intellect which pervades the universe is finally put forward as the foundation of the groundwork of science.

We have endeavoured, as concisely as possible, to give an account of the contents of this bulky volume. It is by no means an easy task to act the part of a reviewer towards what professes to be a kind of philosophy of science, since mere dissent from the author's conclusions is not in itself a legitimate ground of criticism. For the philosophical student it may be fairly said that Dr. Mivart has provided material for endless controversy. For the worker in science he has raised many important questions which are well worth pondering over. Of course we agree generally that there is in reality only one science, and that the various divisions are matters of convenience necessitated by limited brain power. There is, in fact, a real need for a science of the sciences or Epistemology, but the treatment of the subject in the present work appears to the writer to be disappointing. There seems to be a continual working up towards some great generalisation which never comes off. There is over-elaboration in some parts of the treatment, and there are sudden jumps in others. The use of "new departures" or "breaches of continuity" as arguments for the existence of an external non-human intelligence appears to be a relapse towards the state of knowledge which interpolated a "guiding spirit," or an "occult principle," or an "innate tendency," to explain anything we did not understand. It is a dangerous principle in science to attempt to hide ignorance by devices of this kind. The coupling of discontinuous variations in animals and plants with the production of a chemical compound having different properties from its constituents as examples of such "new departures" is singularly unfortunate, even from Dr. Mivart's own point of view.

There is much in the work which will repay thoughtful perusal, since any attempt to make scientific workers take a philosophical view of science is to be commended. But the great defect of diffusiveness, which is so conspicuous throughout the book, will, we are afraid, deter many readers from following the author throughout the laboured and reiterated statements which lead up to his conclusions.

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THE UGANDA PROTECTORATE.

Under the African Sun: a Description of Native Races in Uganda, Sporting Adventures, and other Experiences. By Dr. W. J. Ansorge. Pp. xiv + 355. (London: Heinemann, 1899.)

THE complaint has often been made against travellers that in their books they tell us most about the subjects of which they know least. The latest contribution to the literature of the Uganda Protectorate illustrates the truth of this remark. From the list of qualifications after the author's name in the title-page, the book might be expected to prove a valuable contribution to the knowledge of the many obscure diseases endemic in the Uganda Protectorate.

Occasional medical experiences are recorded, but they deal with mere matters of minor surgery. The important problems connected with tropical diseases, to which so much attention is now being devoted, are passed unnoticed. Most of this bulky volume is devoted to experiences in sport, war and civil administration, such as we might expect from a soldier, rather than from a man with a scientific training. The main value of the book is that it gives an account of the Uganda Protectorate and